

# Symbiodiniaceae: The Key to Coral Preservation

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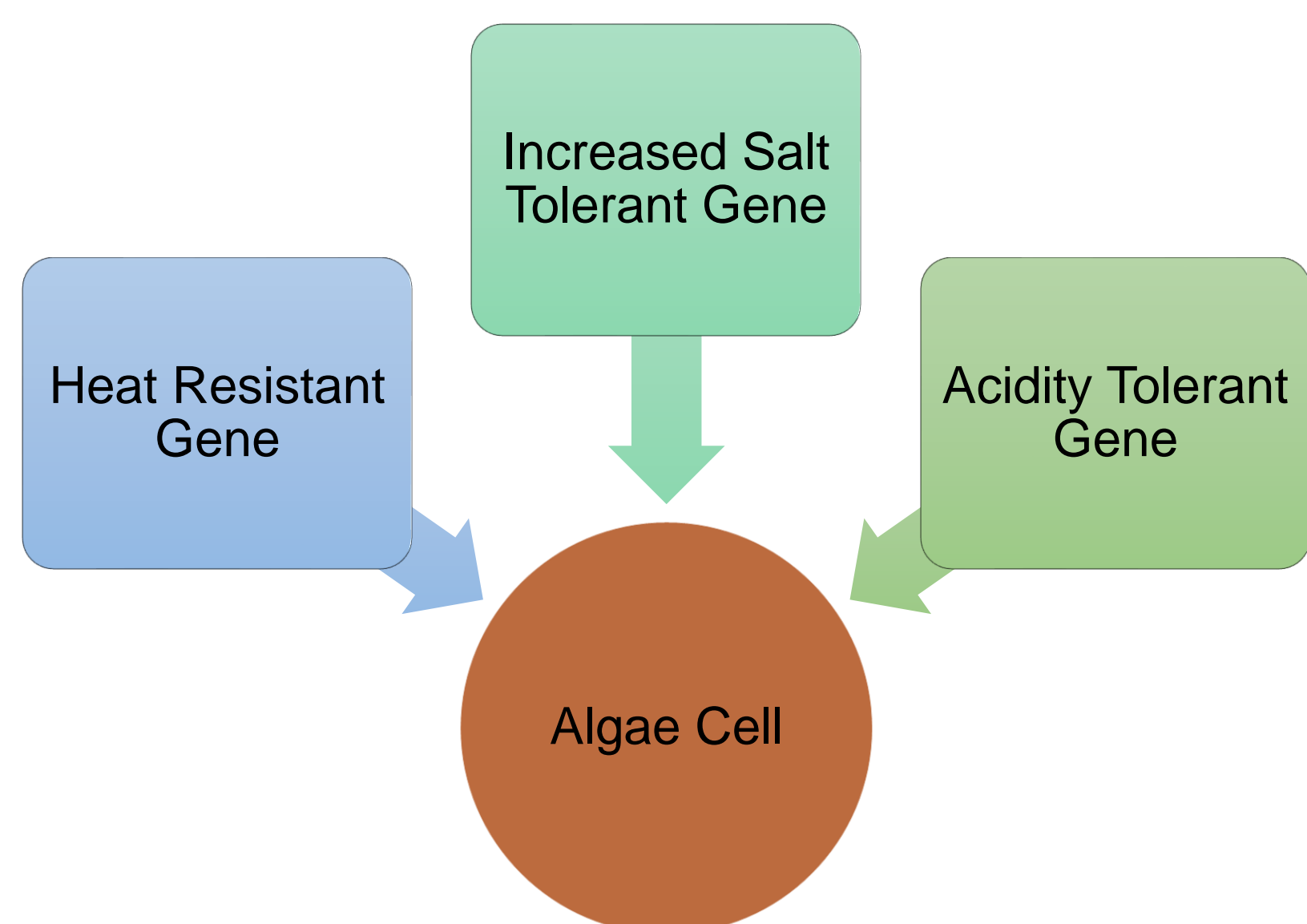
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## Coral Preservation

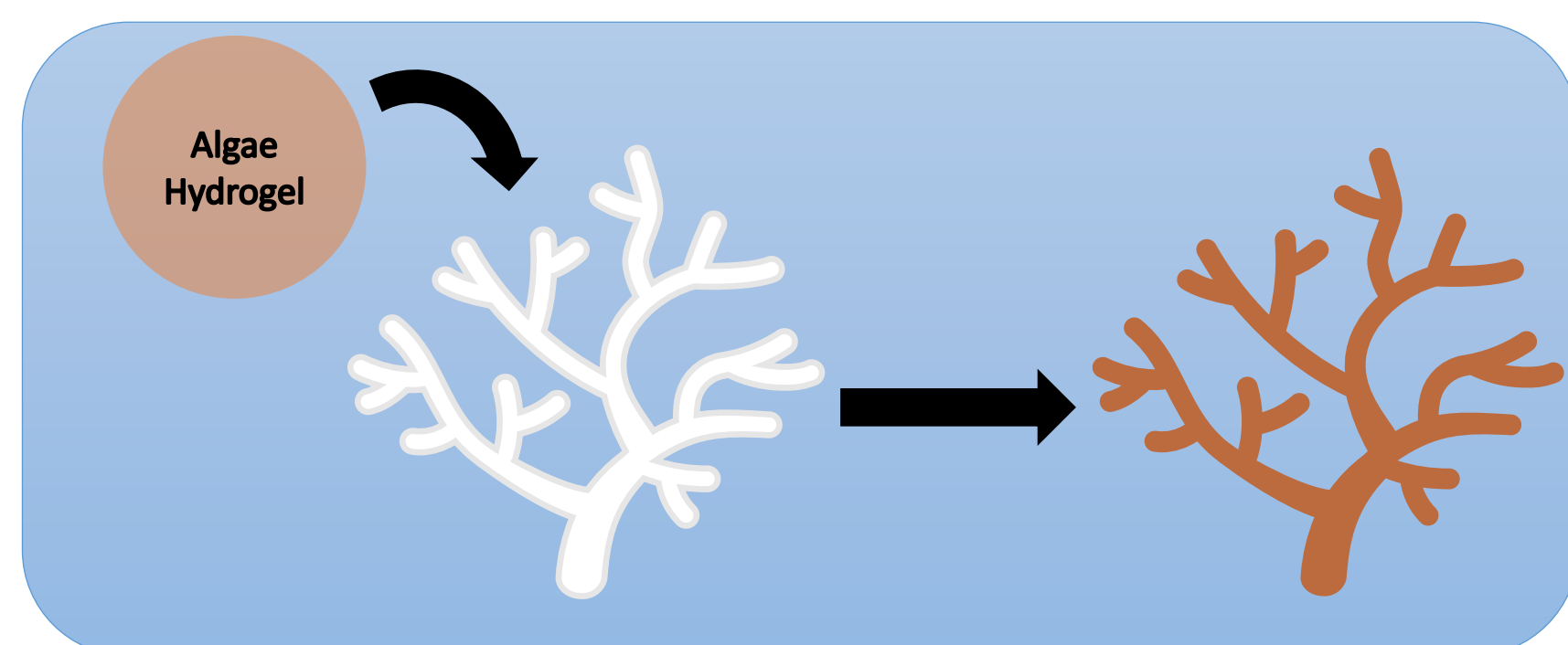
- Coral bleaching, or the expulsion of Symbiodiniaceae from their host, often leads to coral death [1]
- Current genetic transformation tools are successful with some microalgae, but have yet to work with dinoflagellates [2]
- Modified algae could provide extra protection to prevent bleaching suited to the harsh and changing climate so expulsion does not occur
- Bleached coral can be revitalized by introducing its symbiont back to the system

## Algae Manipulation Applications



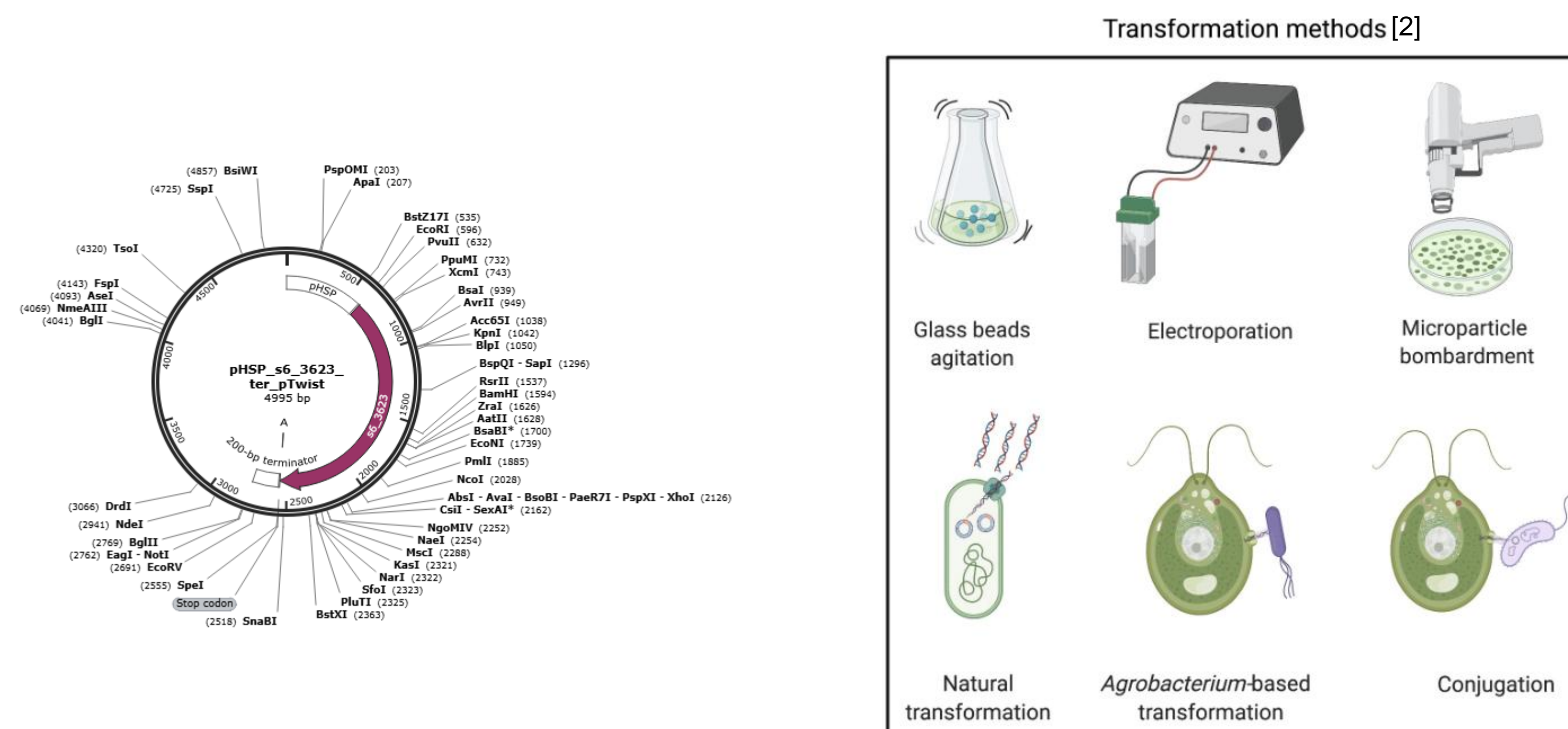
## Hypothesis

- Through genetic transformation, we expect to enhance the genetic makeup of algae to combat expulsion when environmental conditions are not optimal to maintain the natural coral-algae symbiotic relationship
- By delivering algae encapsulated by a biodegradable hydrogel back to coral, we can return coral reefs to their healthy state



## Methods and Results

### Algae (*Breviolum minutum*) transformation methods



### Algae (*B. minutum*) hydrogel delivery to anemone (*Exaiptasia diaphana*)



## Future work

- Construct a plasmid that is tunable to any dinoflagellate for optimal transformation conditions
- Synthesize different types of hydrogels for successful algae cell encapsulation and digestion within coral
- Algae hydrogel delivery to bleached anemone for full recovery

## Conclusions

- Transformation of *B. minutum* faces challenges due to a thick cell wall and complex genome sequence [3]
- Algae cells can successfully be encapsulated in a hydrogel
- Hydrogel is recognized as food when presented to the anemone
- Developing a plasmid, deliverable and adaptable to any dinoflagellate cell which will then be encapsulated in a fully degradable hydrogel.

## Acknowledgements

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## References

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- [3] Pairs, P.I., Dundon, M.L., Narváez-Vásquez, J. *et al.* Cell wall digestion of the dinoflagellate *Breviolum minutum*. *J Appl Phycol* **36**, 181–189 (2024).
- [4] Brown, B. Coral bleaching: causes and consequences. *Coral Reefs* **16** (Suppl 1), S129–S138 (1997).
- [5] K.R.N. Anthony, D.I. Kline, G. Diaz-Pulido, S. Dove, O. Hoegh-Guldberg, Ocean acidification causes bleaching and productivity loss in coral reef builders, *Proc. Natl. Acad. Sci. U.S.A.* **105** (45) 17442–17446.